



TFT LCD Approval Specification

MODEL NO.: M240J1- L03

Customer:	JVC
Approved by:	
Note:	

記錄	工作	審核	角色	投票
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**REVISION HISTORY**

Version	Date	Section	Description
Ver 2.0	Oct. 9, 06'	-	M240J1 -L03 Approval specifications was first issued.
Ver 3.0	Feb. 26, 07'	10.1	Customer's barcode definition is QLD0466-002.



1. GENERAL DESCRIPTION

1.1 OVERVIEW

M240J1-L03 is an 24.0" TFT Liquid Crystal Display module with 6 CCFL Backlight unit and 30 pins 2ch-LVDS interface. This module supports 1920 x 1200 WUXGA mode and can display up to 16.7M colors. The inverter module for Backlight is built in.

1.2 FEATURES

- Super MVA extra-wide viewing angle.
- High contrast ratio.
- Fast response time.
- High color saturation.
- WUXGA (1920 x 1200 pixels) resolution.
- DE (Data Enable) only mode.
- LVDS (Low Voltage Differential Signaling) interface.
- RoHS compliance.
- TCO'03 compliance.
- Scan function support by the inverter module that built in the Backlight unit.

1.3 APPLICATION

- TFT LCD Monitor

1.4 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Active Area	518.4 (H) x 324 (V) (24.0" diagonal)	mm	(1)
Bezel Opening Area	522.4 (H) x 328.0 (V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1920 x R.G.B. x 1200	pixel	-
Pixel Pitch	0.270 (H) x 0.270 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16.7M	color	-
Transmissive Mode	Normally black	-	-
Surface Treatment	AG type: Hard coating (3H), Anti-glare (Haze 25) Glare type: 2H hard coating, reflection<3%	-	-

1.5 MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	545.9	546.4	546.9	(1)
	Vertical(V)	351.5	352.0	352.5	
	Depth(D)		41.2	41.7	
Weight	-	-	3000	g	-

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T _{ST}	-20	60	°C	(1)
Operating Ambient Temperature	T _{OP}	0	50	°C	(1), (2)
Shock (Non-Operating)	S _{NOP}	-	50	G	(3), (5)
Vibration (Non-Operating)	V _{NOP}	-	1.5	G	(4), (5)

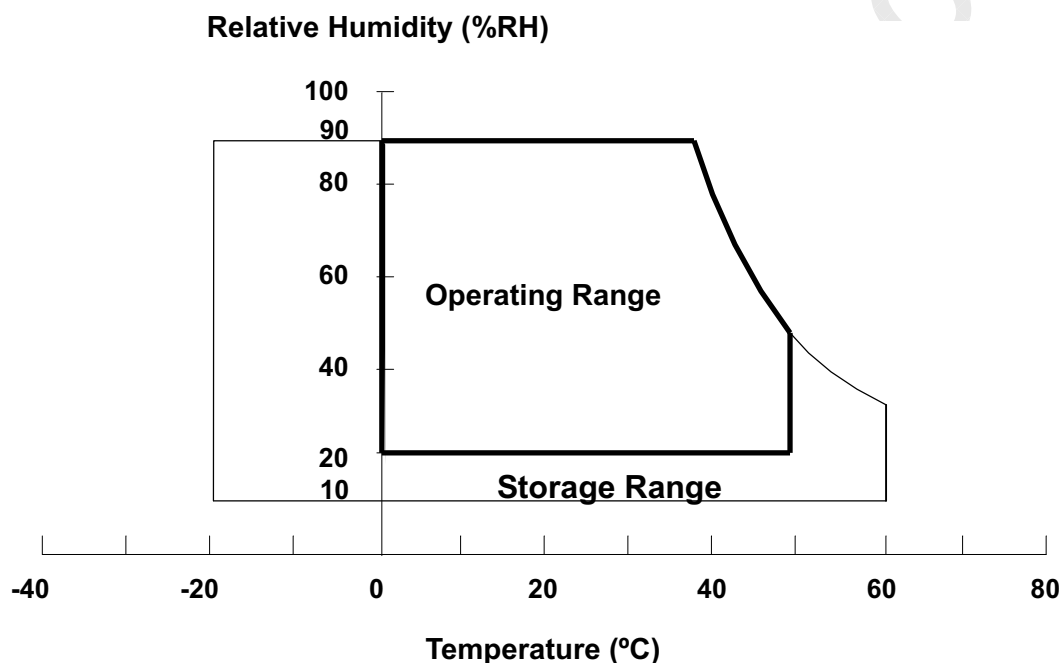
Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. ($T_a \leq 40\text{ }^{\circ}\text{C}$).

(b) Wet-bulb temperature should be 39 °C Max. ($T_a > 40\text{ }^{\circ}\text{C}$).

(c) No condensation.

Note (2) The temperature of panel display surface area should be 0 °C Min. and 60 °C Max.

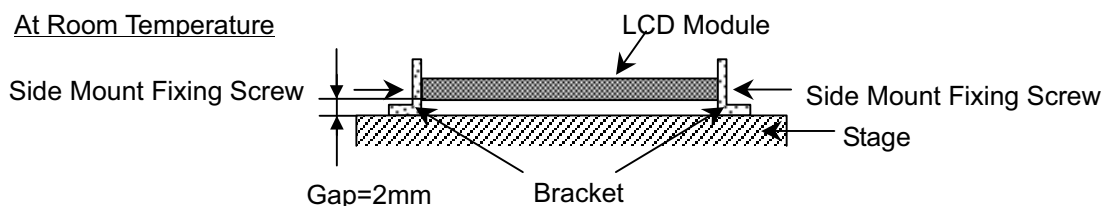


Note (3) 11ms, half sine wave, 1 time for $\pm X$, $\pm Y$, $\pm Z$.

Note (4) 10 ~ 300 Hz, 10min/cycle, 3 cycles each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

The fixing condition is shown as below:





2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	V _{CC}	-0.3	+6.0	V	(1)
Logic Input Voltage	V _{IN}	-0.3	4.3	V	

2.2.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	V _L	-	4.5K	V _{RMS}	(1), (2)
Lamp Current	I _L	4.0	7.0	mA _{RMS}	(1), (2)
Lamp Frequency	F _L	40	80	KHz	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for lamp (Refer to 3.2 for further information).



**CHI MEI**
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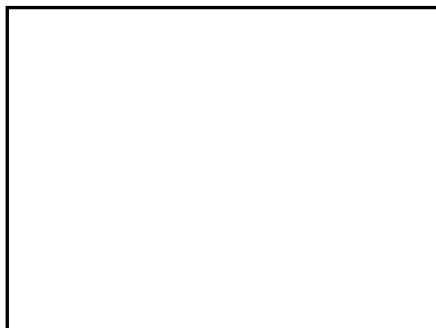
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Model No.: M240J1-L03

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Note (3) The specified power supply current is under the conditions at $V_{CC} = 5.0\text{ V}$, $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$, $f_v = 60\text{ Hz}$, whereas a power dissipation check pattern below is displayed.

a. White Pattern



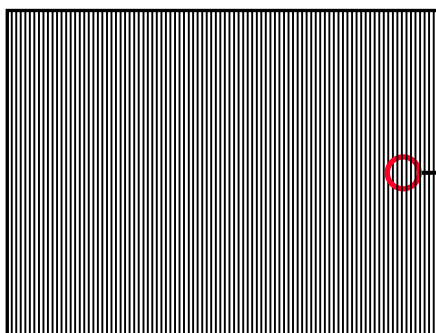
Active Area

b. Black Pattern

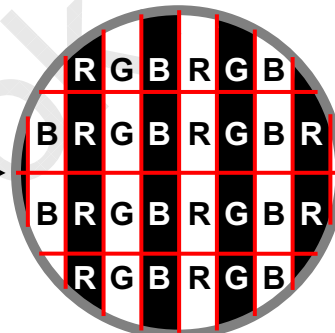


Active Area

c. Vertical Stripe Pattern

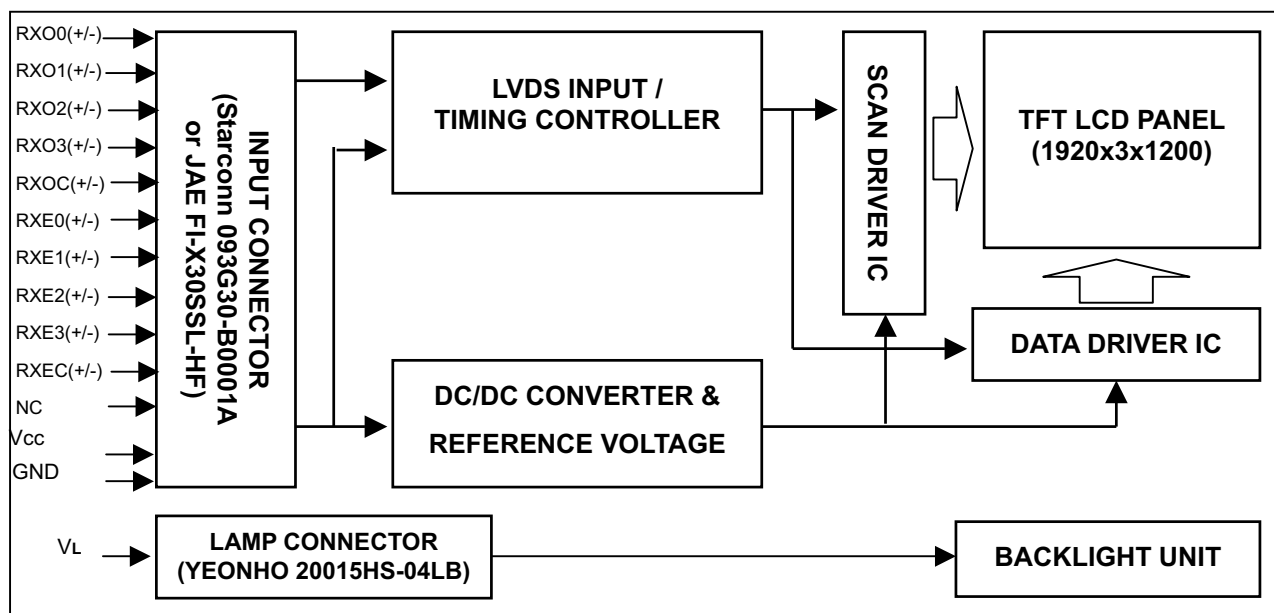


Active Area

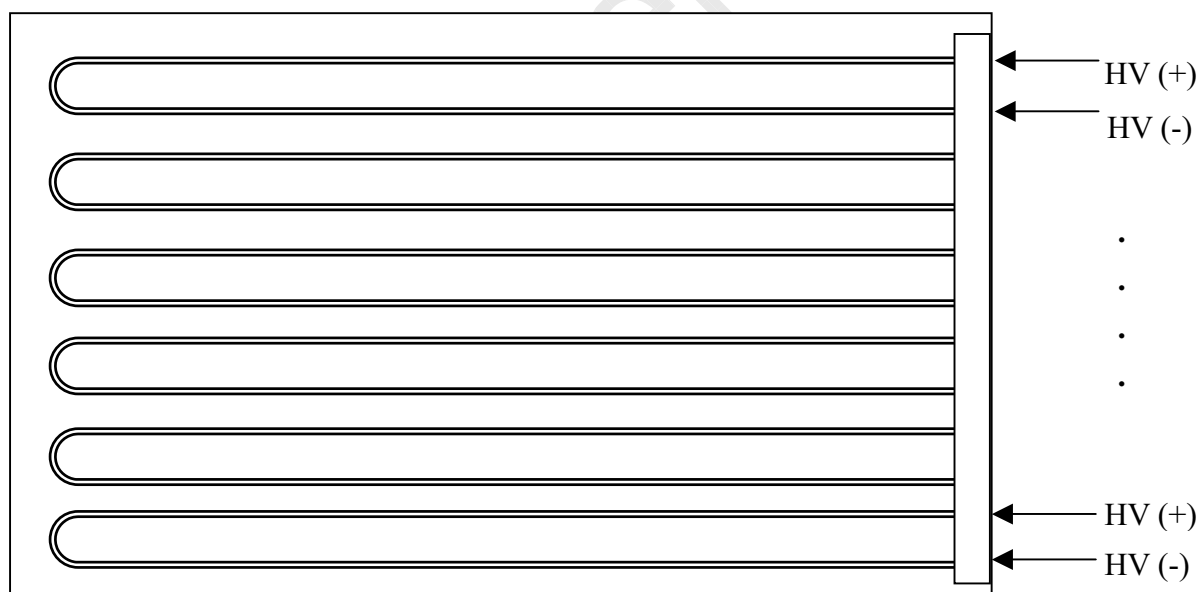


4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



4.2 BACKLIGHT UNIT





5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE

Pin	Name	Description
1	RXO0-	Negative LVDS differential data input. Channel O0 (odd)
2	RXO0+	Positive LVDS differential data input. Channel O0 (odd)
3	RXO1-	Negative LVDS differential data input. Channel O1 (odd)
4	RXO1+	Positive LVDS differential data input. Channel O1 (odd)
5	RXO2-	Negative LVDS differential data input. Channel O2 (odd)
6	RXO2+	Positive LVDS differential data input. Channel O2 (odd)
7	GND	Ground
8	RXOC-	Negative LVDS differential clock input. (odd)
9	RXOC+	Positive LVDS differential clock input. (odd)
10	RXO3-	Negative LVDS differential data input. Channel O3(odd)
11	RXO3+	Positive LVDS differential data input. Channel O3 (odd)
12	RXE0-	Negative LVDS differential data input. Channel E0 (even)
13	RXE0+	Positive LVDS differential data input. Channel E0 (even)
14	GND	Ground
15	RXE1-	Negative LVDS differential data input. Channel E1 (even)
16	RXE1+	Positive LVDS differential data input. Channel E1 (even)
17	GND	Ground
18	RXE2-	Negative LVDS differential data input. Channel E2 (even)
19	RXE2+	Positive LVDS differential data input. Channel E2 (even)
20	RXEC-	Negative LVDS differential clock input. (even)
21	RXEC+	Positive LVDS differential clock input. (even)
22	RXE3-	Negative LVDS differential data input. Channel E3 (even)
23	RXE3+	Positive LVDS differential data input. Channel E3 (even)
24	GND	Ground
25	NC	No connection
26	NC	Not connection.
27	VCC	+5.0V power supply
28	VCC	+5.0V power supply
29	VCC	+5.0V power supply
30	VCC	+5.0V power supply

Note (1) Connector Part No.: Starconn 093G30-B0001A or JAE FI-X30SSL-HF.

Note (2) The first pixel is odd.

Note (3) Input signal of even and odd clock should be the same timing.



SELLVDS = Low or Open								
LVDS Channel E0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	EG0	ER5	ER4	ER3	ER2	ER1	ER0
LVDS Channel E1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	EB1	EB0	EG5	EG4	EG3	EG2	EG1
LVDS Channel E2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	EB5	EB4	EB3	EB2
LVDS Channel E3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	EB7	EB6	EG7	EG6	ER7	ER6
LVDS Channel O0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	OG0	OR5	OR4	OR3	OR2	OR1	OR0
LVDS Channel O1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	OB1	OB0	OG5	OG4	OG3	OG2	OG1
LVDS Channel O2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	OB5	OB4	OB3	OB2
LVDS Channel O3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	OB7	OB6	OG7	OG6	OR7	OR6

5.2 BACKLIGHT UNIT:

Pin	Symbol	Description	Remark
1-1	HV	High Voltage	Pink
1-2	HV	High Voltage	White
2-3	HV	High Voltage	Pink
2-4	HV	High Voltage	White
3-5	HV	High Voltage	Pink
3-6	HV	High Voltage	White
4-7	HV	High Voltage	Pink
4-8	HV	High Voltage	White
5-9	HV	High Voltage	Pink
5-10	HV	High Voltage	White
6-11	HV	High Voltage	Pink
6-12	HV	High Voltage	White

Note (1) Connector Part No.: 20015HS-04LB (YEONHO) or equivalent



5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	R7	R6	G5	G4	G3	G2	G1	G0	R7	R6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
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	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
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	Green(253)	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
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	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0
Gray Scale Of Blue	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage



6. INVERTER SPECIFICATIONS

6.1 CONNECTOR TYPE

Items	Input connector type	Output connector type
CN1	YEONHO 20022WR-14L	YEONHO 20022HS-14L
CN2	ACES 88260-02001-06	ACES 87214-0200
CAN-CNE	YEONHO 20015HS-04LB	YEONHO 20015WR-07B

6.2 INPUT CONNECTOR PIN ASSIGNMENT

CN1 : YEONHO 20022WR-14L

No.	Signal	Feature
1	V _{BL}	+24 V
2		
3		
4		
5		
6	GND	GND
7		
8		
9		
10		
11	SOS	Shutdown Protection Signal
12	BLON	BL ON/OFF
13	ADIM	Analog Mode Dimming
14	SCAN ON/OFF	SCAN BL ON/OFF

CN2 : ACES 88260-02001-06

No.	Signal	Feature
1	STV	STV Signal Input
2	GND	GND

6.3 OUTPUT CONNECTOR PIN ASSIGNMENT

CNA-CNE : YEONHO 20015WR-07B

No.	Signal	Feature
1	CFL HOT	CFL High Voltage
2	CFL HOT	CFL High Voltage



6.4 GENERAL ELECTRICAL SPECIFICATIONS

6.4.1 ABSOLUTE MAXIMUM RATING

NO.	ITEM	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE ⁽¹⁾
1	INPUT VOLTAGE	V _{IN}	-	0	-	28	V	
2	SHUTDOWN PROTECTION SIGNAL	SOS	-	-0.5	-	6.5	V	
3	ON/OFF CONTROL VOLTAGE	V _{BLOn}	-					
4	ANALOG DIMMING VOLTAGE	V _{ADIM}	-					
5	SCAN MODE ON/OFF CONTROL VOLTAGE	V _{SCAN}	-					
6	STV SIGNAL	V _{STV}	-					
7	OPERATING TEMPERATURE	T _{OP}	5~90% RH	0	-	75	°C	Protect inverters from moisture condensation and freezing. (Note 1)
8	STORAGE TEMPERATURE	T _{ST}	5~95% RH	-30	-	80	°C	

Note: The absolute maximum rating that a rated value must not be exceeded during operation. When it is used exceeding the maximum rating, for a certain reason, a possibility that an inverter may be damaged also recommends being used fully in operating condition as below.

6.4.2 OPERATING CONDITION

NO.	ITEM	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE ⁽¹⁾
1	POWER CONSUMPTION	P _{BL}	Normal mode	-	-	72	W	
2	INPUT VOLTAGE	V _{BL}	-	21.6	24	26.4	V	
3	INPUT CURRENT	I _{IN}	-	-	3	3.5	A	
4	SHUTDOWN PROTECTION SIGNAL	SOS	Normal	-	0	-	V	
			Abnormal	-	5	-	V	
5	ON/OFF CONTROL VOLTAGE	V _{BLOn}	V _{BLOn} =ON	2.5	-	5	V	
			V _{BLOn} =OFF	0	-	0.8	V	
6	ANALOG DIMMING VOLTAGE	V _{ADIM}	Max.	-	5	-	V	
			Min.	-	0	-	V	
7	SCAN MODE ON/OFF CONTROL VOLTAGE	V _{SCAN}	V _{SCAN} =H	2.5	-	5	V	
			V _{SCAN} =L	0	-	0.8	V	
8	STV SIGNAL	T _{STV}	V _{SYN} =H	2.5	-	5	V	
			V _{SYN} =L	0	-	0.8	V	
9	OPERATING TEMPERATURE	T _{OP}	20~95% RH	0	-	60	°C	Protect inverters from moisture condensation and freezing. (Note 1)
10	STORAGE TEMPERATURE	T _{ST}	5~95% RH	-20	-	75	°C	

Note 1 Temperature and relative humidity condition are as below.

(a) 90 %RH Max. (Ta ≤ 40 °C)

(b) Wet-bulb temperature should be 39 °C Max. (Ta > 40 °C).

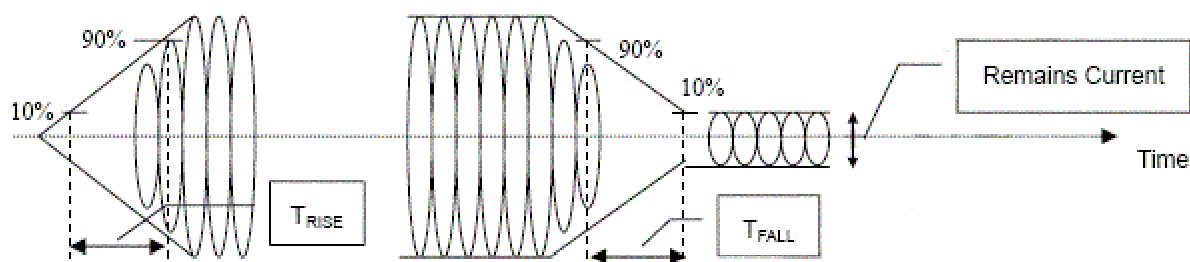
(c) No condensation of water.

6.4.3 INITIAL CHARACTERISTICS ($T_a = 25 \pm 5^\circ\text{C}$)

NO.	ITEM	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
1	INPUT VOLTAGE	V_{BL}	-	21.6	24	26.4	V	
2	INPUT CURRENT	I_{BL}	Normal Mode	-	3	3.5	A	
3	INPUT INRUSH CURRENT	-	$V_{BL}=24\text{ V}$	-	-	6	A_{peak}	
4	INDIVIDUAL MAXIMUM LAMP CURRENT	$I_{L(max.)}$	Normal Mode or Scan Mode	10.4	-	11.4	mA	
5	SCAN MODE INDIVIDUAL LAMP CURRENT	$I_{L(min.)}$	Scan Mode or Scan Mode	2.7	-	3.7	mA	
6	OSCILLATING FREQUENCY	F_W	-	50	55	70	KHz	
7	BURST MODE FREQUENCY	F_B	Normal Mode	-	180	-	Hz	
8	OPEN LAMP VOLTAGE	V_S	$T_a=0^\circ\text{C}$	3900	-	-	V_{rms}	
			$T_a=25^\circ\text{C}$	3670	-	-	V_{rms}	
9	LAMP VOLTAGE	V_W	$T_a=25^\circ\text{C}$	-	1900	-	V_{rms}	
10	RISING TIME	T_{RISE}	-	-	-	500	μs	See Fig. 1, (Note 3)
11	FALLING TIME	T_{FALL}	-	-	-	500	μs	
12	START-UP TIME	T_S	$\geq 0.9 \cdot I_L$	1	-	2	Sec.	Power on to I_L stabilize period
13	TOTAL EFFICIENCY	η	-	80	-	-	%	P_{BL} / P_L , (Load: CCFL)

Note 2 Lamp for measurement, use back light: 24" back light unit. The measurement result is a result after 30 minutes of lighting.

Note 3 The definitions of rising time, falling time and remains current are based on high side lamp current and diagramed as Fig.1.





6.4.4 PROTECTION CHARACTERISTICS

NO.	ITEM	TEST CONDITION	RESPONSE OF SUBJECT	NOTE
1	OPEN LAMP PROTECTION (OLP)	-	Shutdown	1S<T _{fault} <2S (Note 4~7)
2	OUTPUT SHORT PROTECTION (OSP)	Output Shutter: 2 KΩ	Shutdown or I _{short} (peak value) ≤ 2.8*I _{rms}	
3	INPUT OVER VOLTAGE PROTECTION (IOP)	≥ 1.25*V _{in} (typ)	Shutdown	
4	INPUT UNDER VOLTAGE PROTECTION (IUP)	≤ 0.8*V _{in} (typ)	Shutdown	

Note 4 T_{fault} is the duration since inverter ignition till shutdown by protection circuit is triggered.

Note 5 Any output short outside inverter should be protected.

Note 6 Whatever the above items occurred before inverter turn on or under inverter operating duration that inverter should be protected.

Note 7 When OLP & OSP protections have been trigged, inverter shall be restarted by input power source and V_{BLOn} signal.

6.4.5 INTERFACE CHARACTERISTICS

NO.	ITEM		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE ⁽¹¹⁻¹²⁾
1	ON/OFF CONTROL VOLTAGE	ON	V _{BLOn}	-	2.5	-	5	V	
		OFF		-	0	-	0.8	V	
2	ANALOG DIMMING VOLTAGE	MAX	V _{ADIM}	-	-	-	5	V	Minimum Duty Ratio
		MIN		-	-	0	-	V	Maximum Duty Ratio
3	SCAN MODE CONTROL VOLTAGE	ON	V _{SCAN}	-	2.5	-	5	V	
		OFF		-	0	-	0.8	V	
4	STV SINGLE VOLTAGE	HI	V _{STV}	-	2.5	-	5	V	Ext. Dim. Control
		LO		-	0	-	0.8	V	Int. Dim. Control

Note 8 Even if control signal over range in any conditions that there must no smell, smoke, and fire cause by any failure on inverter PCB or components.

Note 9 All the interface circuits without spike suppress component hence the hot plug in or plug out of all connectors are inhibited.



6.4.6 Inverter Operating Mode

No	OPERATING STATUS	ON/OFF CONTROL VBLON		ANALOG DIMMING VADIM.		SCAN MODE CONTROL VSCAN		STV SINGLE INPUT VSTV	
		ON	OFF	MAX.	MIN.	ON	OFF	ENABLE	DISABLE
		2.5~5V	0~0.8V	5V	0V	2.5~5V	0~0.8V	2.5~5V	0~0.8V
1	INVERTER OFF	-	-	DISABLE		DON'T CARE	DON'T CARE	DON'T CARE	DON'T CARE
2	NORMAL MODE OPERATION	V	-	ENABLE		-	V	V	-
3	SCAN MODE OPERAION	V	-	ENABLE		V	-	V	-
4	PROTECTION MODE OPERATION(NOTE 10)	V	-	DISABLE		DON'T CARE	DON'T CARE	-	V

7. INTERFACE TIMING

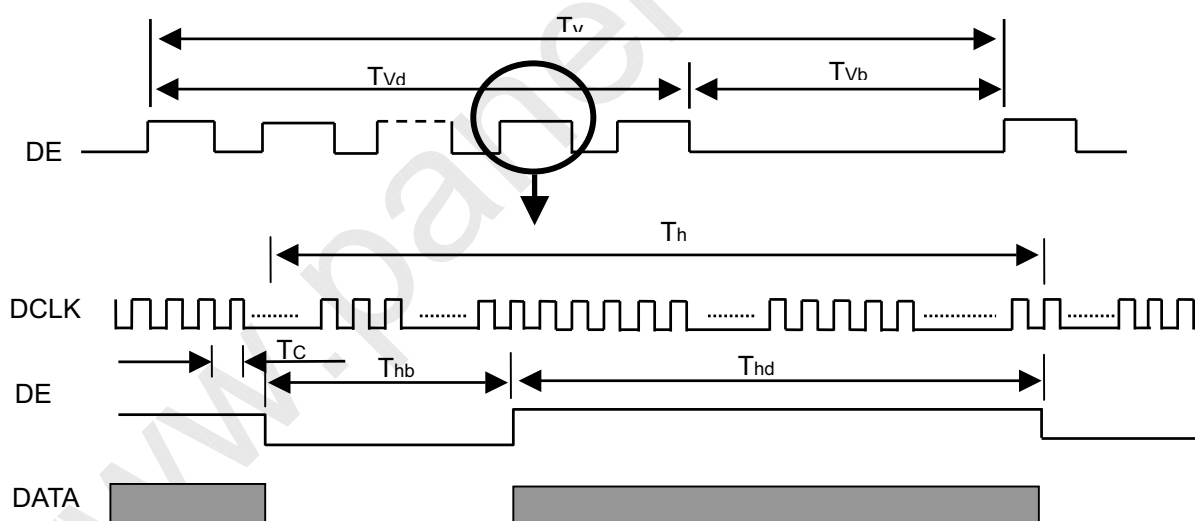
7.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	Fc	50.0	77	83.0	MHz	-
	Period	Tc	-	13.0	-	ns	-
	High Time	Tch	-	4/7	-	Tc	-
	Low Time	Tcl	-	3/7	-	Tc	-
LVDS Data	Setup Time	Tlvs	600	-	-	ps	-
	Hold Time	Tlvh	600	-	-	ps	-
Vertical Active Display Term	Frame Rate	Fr	40	60	63	Hz	Tv=Tvd+Tvb
	Total	Tv	1209	1235	1245	Th	-
	Display	Tvd	1200	1200	1200	Th	-
	Blank	Tvb	(9)	35	Tv-Tvd	Th	-
Horizontal Active Display Term	Total	Th	1030	1040	1075	Tc	Th=Thd+Thb
	Display	Thd	960	960	960	Tc	-
	Blank	Thb	70	80	Th-Thd	Tc	-

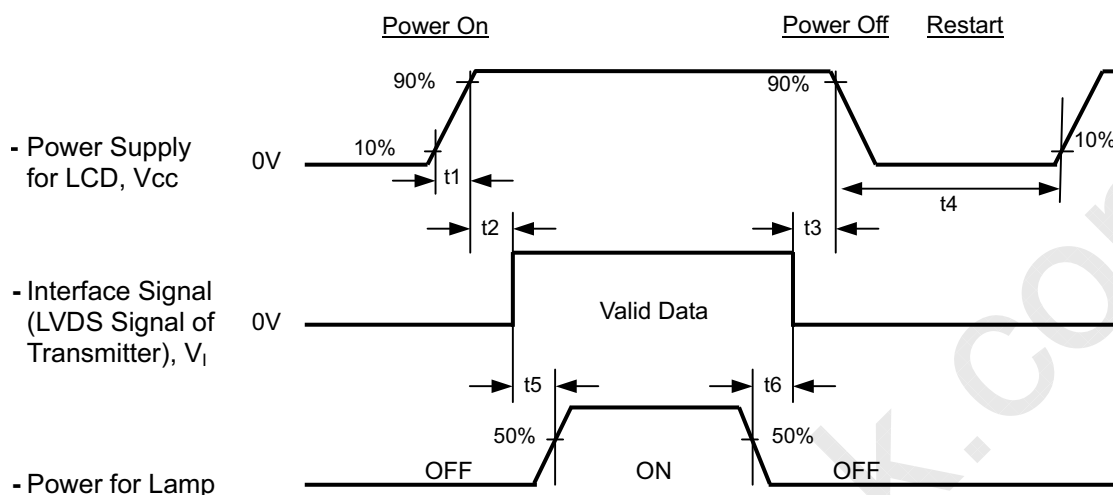
Note: Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

INPUT SIGNAL TIMING DIAGRAM



7.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be as the diagram below.



Timing Specifications:

$$0.5 < t_1 \leq 10 \text{ msec}$$

$$0 < t_2 \leq 50 \text{ msec}$$

$$0 < t_3 \leq 50 \text{ msec}$$

$$t_4 \geq 500 \text{ msec}$$

$$t_5 \geq 500 \text{ msec}$$

$$t_6 \geq 90 \text{ msec}$$

8. OPTICAL CHARACTERISTICS

8.1 TEST CONDITIONS

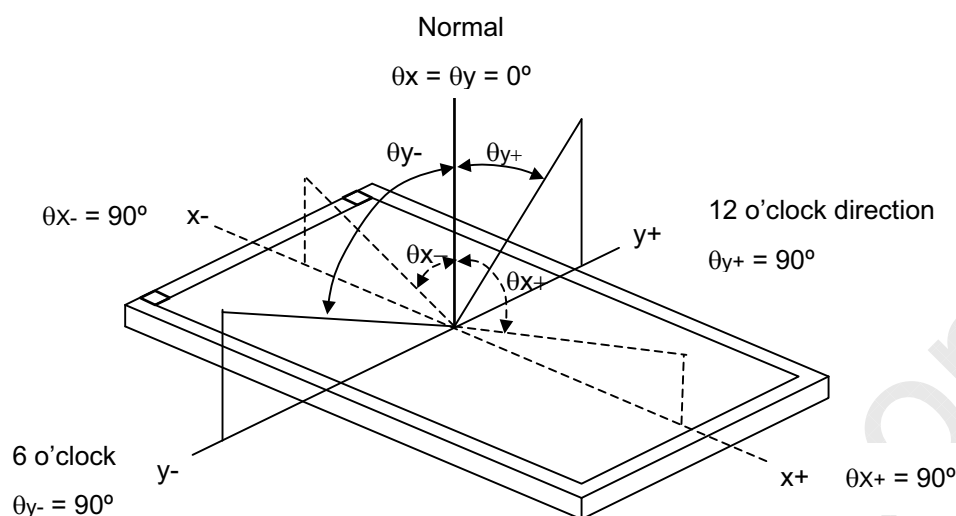
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V _{CC}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current	I _L	(6.0)	mA
Inverter Operating Frequency	F _L	50	KHz
Inverter	BSVD24U01A		

8.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (5).

Item		Symbol	Condition		Min.	Typ.	Max.	Unit	Note
Color Chromaticity (CIE 1931)	Red	R _x	$\theta_x=0^\circ, \theta_Y=0^\circ$ CS-1000T		Typ - 0.03	0.640	Typ + 0.03	-	(1), (5)
		R _y				0.348			
	Green	G _x				0.293			
		G _y				0.585			
	Blue	B _x				0.143			
		B _y				0.075			
	White	W _x				0.313			
		W _y				0.329			
	Center Luminance of White (Center of Screen)					L _c			
Contrast Ratio		CR	700	1000	-	-	(2), (5)		
Response Time		T _R	$\theta_x=0^\circ, \theta_Y=0^\circ$		-	13	18	ms	(3),(7)
		T _F			-	7	12		
		T _{GtoG,AVE}			-	8	13		
Motion Picture Response Time (For Scan Function)		T _{MPRT}	$\theta_x=0^\circ, \theta_Y=0^\circ$	Off	-	19	-	ms	(8)
				On	-	14	-		
White Variation		δW	$\theta_x=0^\circ, \theta_Y=0^\circ$		-	1.25	1.40	-	(5), (6)
Viewing Angle	Horizontal	θ _{x+}	CR ≥ 10		80	88	-	Deg.	(1), (5)
		θ _{x-}			80	88	-		
	Vertical	θ _{y+}			80	88	-		
		θ _{y-}			80	88	-		

Note (1) Definition of Viewing Angle (θ_x , θ_y):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{255} / L_0$$

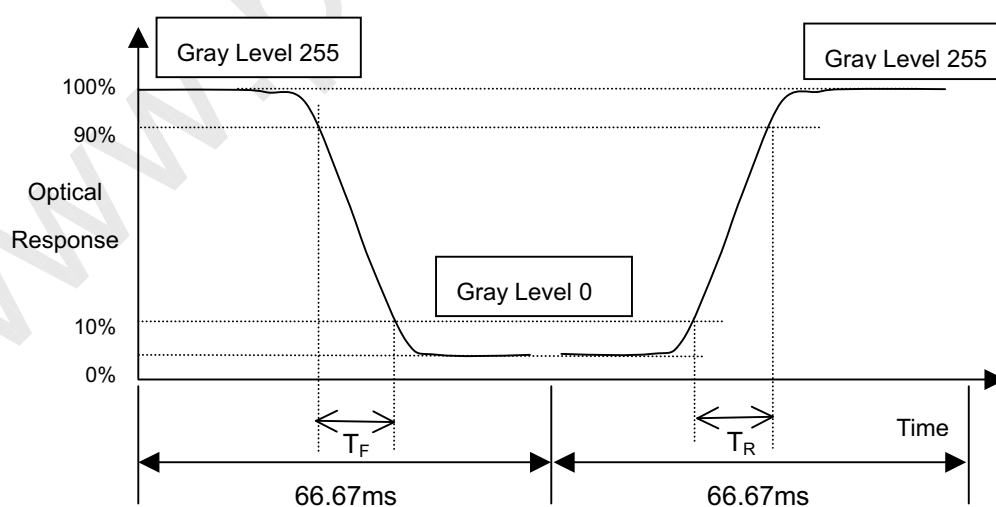
L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (1)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R , T_F):



Note (4) Definition of Luminance of White (L_c):

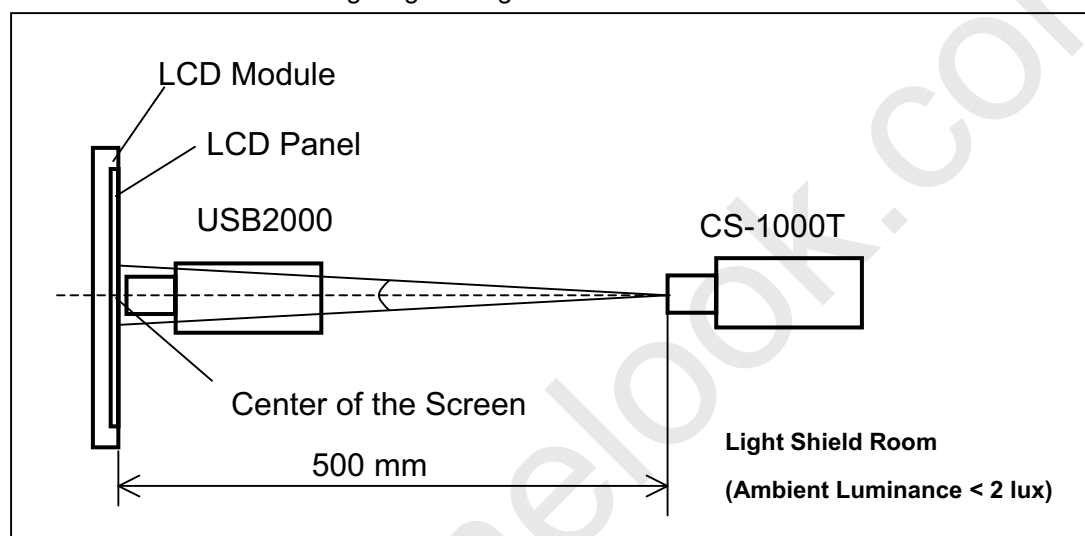
Measure the luminance of gray level 255 at center point

$$L_c = L(1)$$

$L(x)$ is corresponding to the luminance of the point X at Figure in Note (6).

Note (5) Measurement Setup:

The LCD module should be stabilized at given temperature for 40 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 40 minutes in a windless room.





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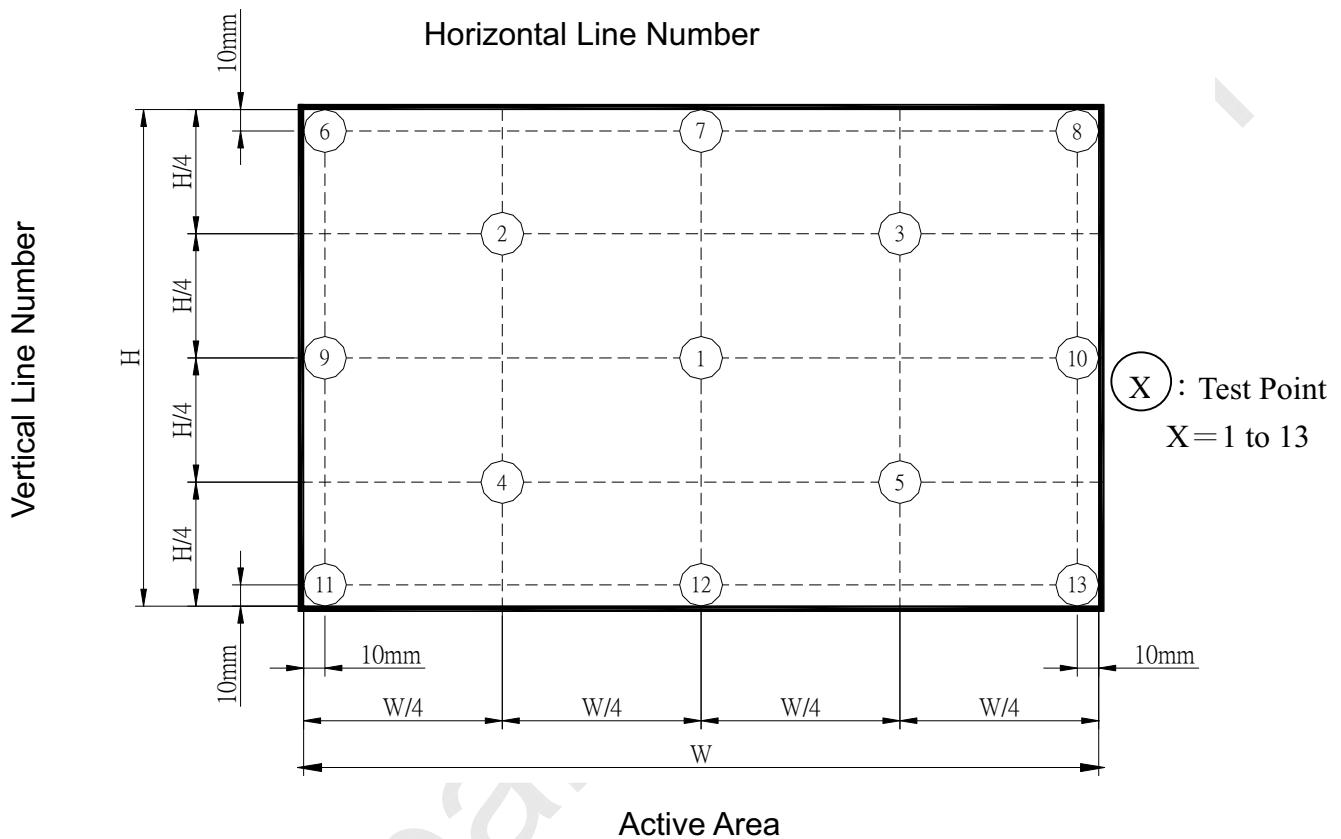
Doc No.:
Issued Date: Feb. 26, 2007
Model No.: M240J1-L03

Approval

Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 13 points

$$\delta W = \frac{\text{Maximum [L(1), L(2), L(3), L(4), L(5), L(6), L(7), L(8), L(9), L(10), L(11), L(12), L(13)]}}{\text{Minimum [L(1), L(2), L(3), L(4), L(5), L(6), L(7), L(8), L(9), L(10), L(11), L(12), L(13)]}}$$



Note (7) Definition of Response Time (T_{GTG_AVE}):

T_{GTG_AVE} is defined as the total average response time for "Gray To Gray ".

The Gray to Gray response time is defined as the following chart.

Gray to Gray		Target Gray								
		G0	G32	G64	G96	G128	G160	G192	G224	G255
Initial Gray	G0									
	G32									
	G64									
	G96									
	G128									
	G160									
	G192									
	G224									
	G255									

Note (8) Definition of MPRT (T_{MPRT}):

The motion picture response time (in mini-second) is the average of blurred edge widths divided by scroll speed u (10 pixels per frame):

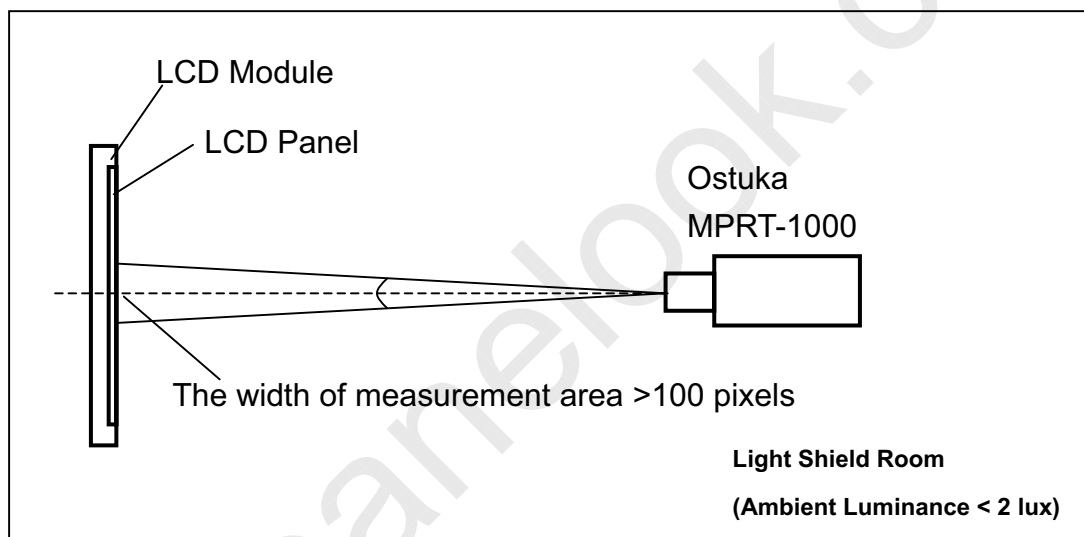
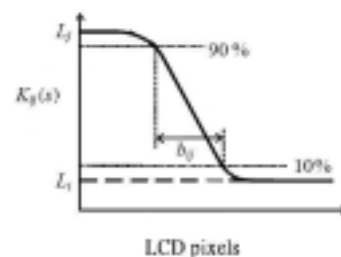
$$T_{MPRT} = \frac{1}{uNf} \sum_{i \neq j} b_{ij}$$

where

b_{ij} is 10% to 90% blurred edge width measured by Otsuka MPRT-1000.

f is frame rate.

N is the number of $i \neq j$ transitions. For the case of nine gray levels ($i = 0, 31, 63, 91, 127, 191, 223, 255; j = 0, 31, 63, 91, 127, 191, 223, 255$, and $i \neq j$).



9. PACKAGING

9.1 PACKING SPECIFICATIONS

- (1) 5 LCD modules / 1 Box
- (2) Box dimensions: 645(L) X 377(W) X 470(H) mm
- (3) Weight: approximately 17.5Kg (5 modules per box)

9.2 PACKING METHOD

- (1) Carton Packing should have no failure in the following reliability test items.

Test Item	Test Conditions	Note
Vibration	ISTA STANDARD Random, Frequency Range: 1 – 200 Hz Top & Bottom: 30 minutes (+Z), 10 min (-Z), Right & Left: 10 minutes (X) Back & Forth 10 minutes (Y)	Non Operation
Dropping Test	1 Angle, 3 Edge, 6 Face, 60cm	Non Operation

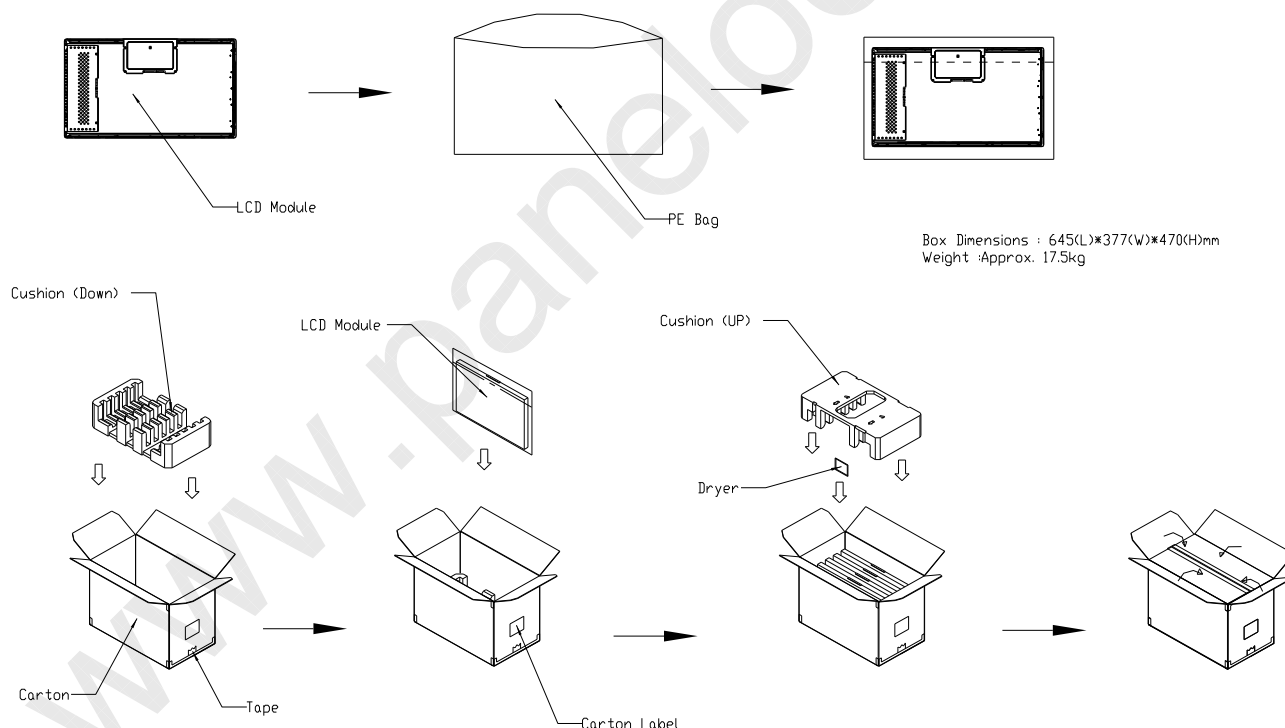


Figure. 9-1 Packing method

For ocean shipping

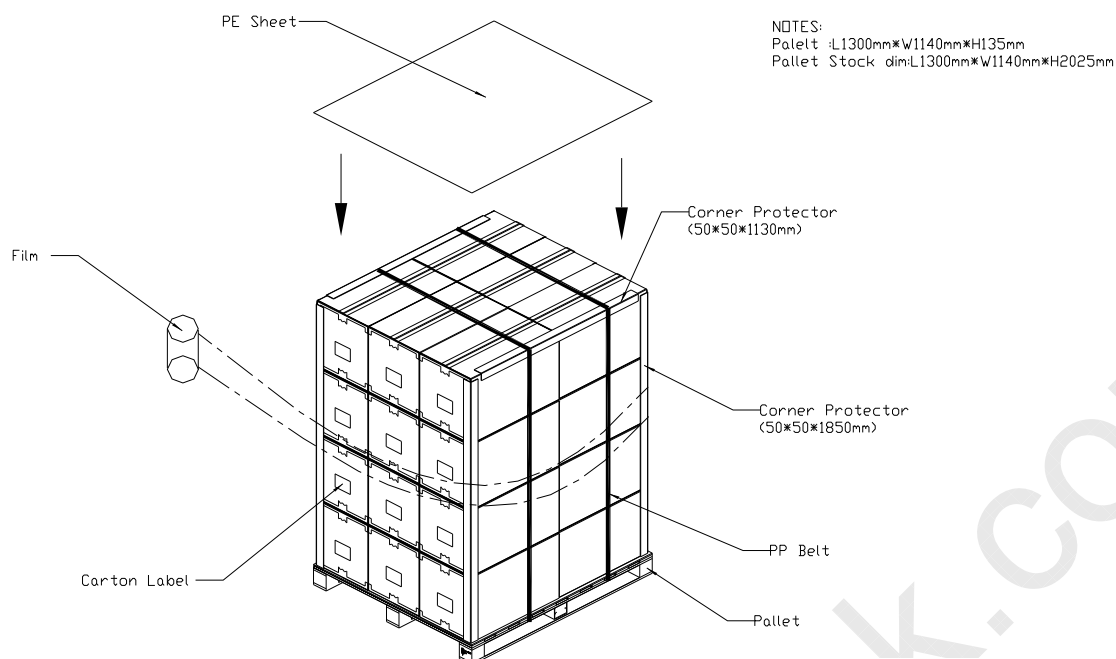


Figure. 9-2 Packing method

For air transport

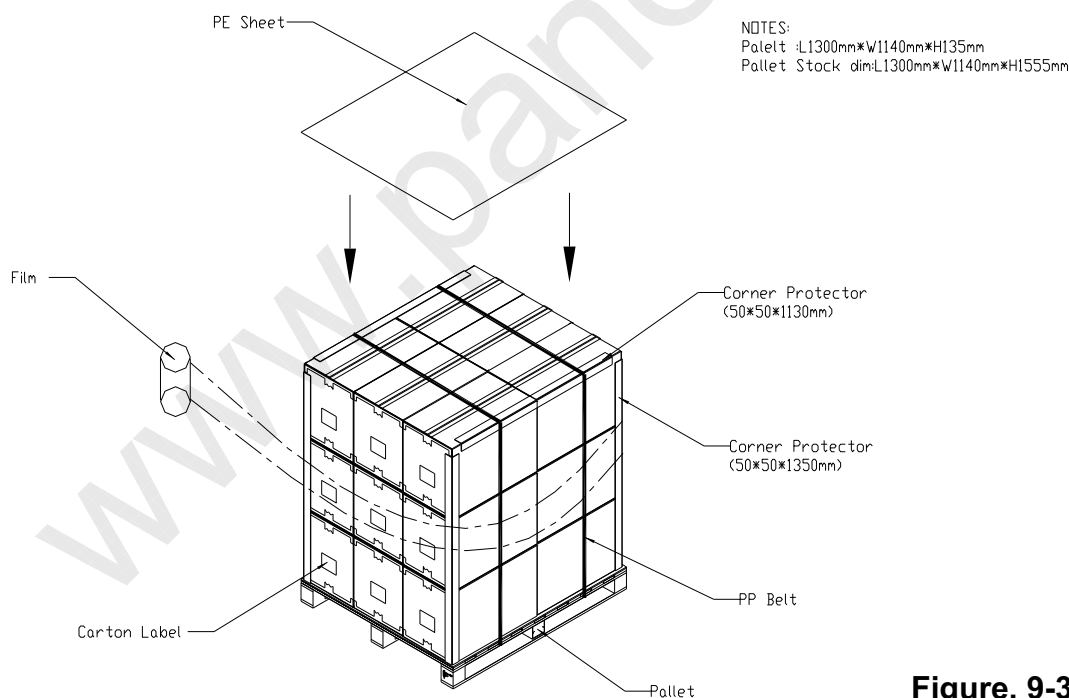


Figure. 9-3 Packing method

10. DEFINITION OF LABELS

10.1 CMO MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



- (a) Model Name: M240J1-L03
- (b) Revision: Rev. XX, for example: A0, A1... B1, B2... or C1, C2...etc.
- (c) CMO barcode definition:

Serial ID: XX-XX-X-XX-YMD-L-NNNN

Code	Meaning	Description
XX	CMO internal use	-
XX	Revision	Cover all the change
X	CMO internal use	-
XX	CMO internal use	-
YMD	Year, month, day	Year: 2001=1, 2002=2, 2003=3, 2004=4... Month: 1~12=1, 2, 3, ~, 9, A, B, C Day: 1~31=1, 2, 3, ~, 9, A, B, C, ~, W, X, Y, exclude I, O, and U.
L	Product line #	Line 1=1, Line 2=2, Line 3=3, ...
NNNN	Serial number	Manufacturing sequence of product

- (d) Customer's barcode definition:

Serial ID: QLD0466-002

11. PRECAUTIONS

11.1 ASSEMBLY AND HANDLING PRECAUTIONS

- (1) Do not apply rough force such as bending or twisting to the module during assembly.
- (2) To assemble or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
- (3) It's not permitted to have pressure or impulse on the module because the LCD panel and Backlight will be damaged.
- (4) Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.
- (5) Do not pull the I/F connector in or out while the module is operating.
- (6) Do not disassemble the module.
- (7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.
- (8) It is dangerous that moisture come into or contacted the LCD module, because moisture may damage



LCD module when it is operating.

- (9) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.
- (10) When ambient temperature is lower than 10°C may reduce the display quality. For example, the response time will become slowly, and the starting voltage of CCFL will be higher than room temperature.

11.2 SAFETY PRECAUTIONS

- (1) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with inverter. Do not disassemble the module or insert anything into the Backlight unit.
- (2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- (3) After the module's end of life, it is not harmful in case of normal operation and storage.



Mark	1	2	3	4	Remark